Validation of TES version 2 ozone profiles

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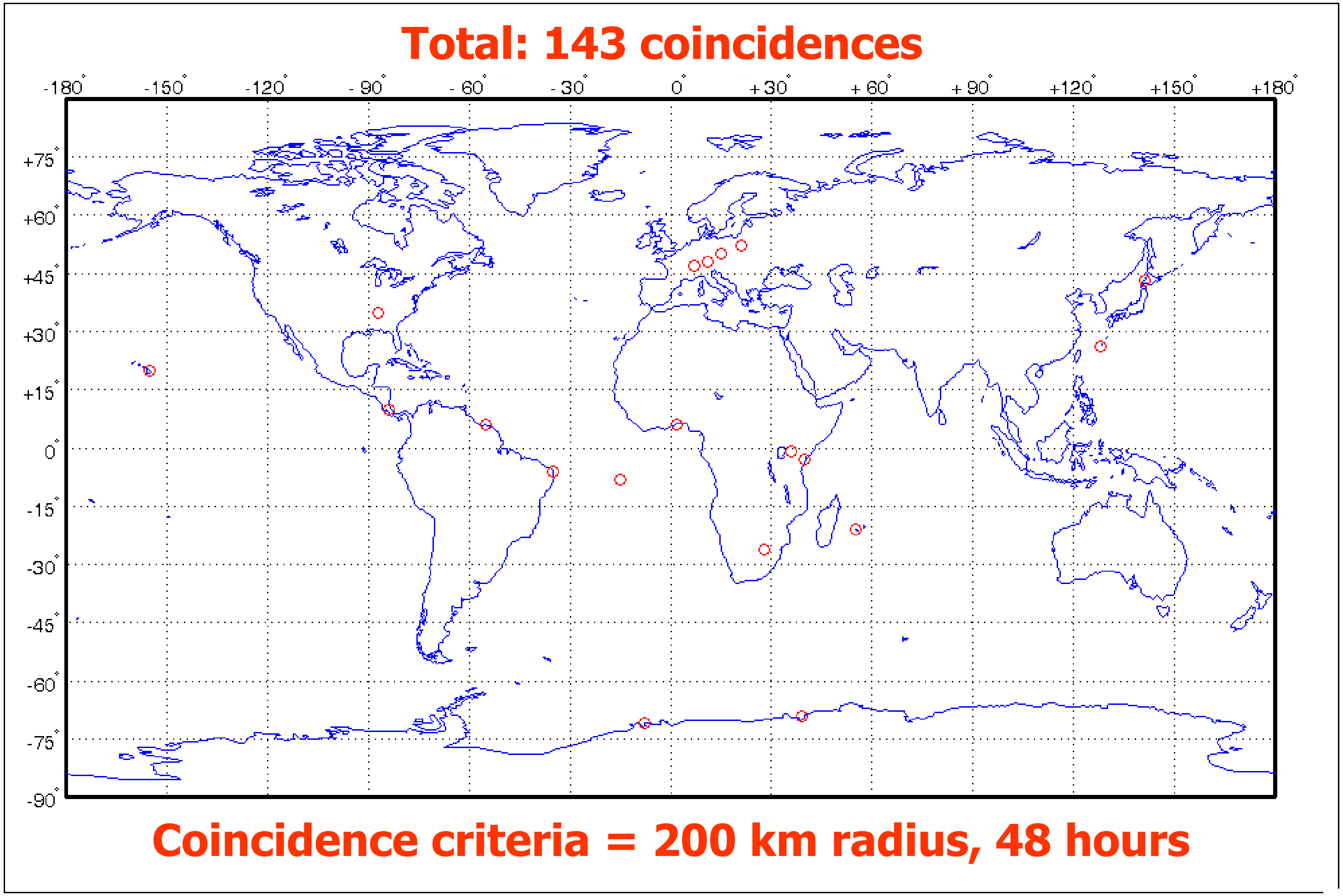
Aura Science Team Meeting, NCAR, Boulder, 2006 September 11-15

World Ozone and Ultraviolet Data Center (WOUDC) and Southern Hemisphere Additional Ozonesonde (SHADOZ) Archive



TES Tropospheric Emission Spectrometer

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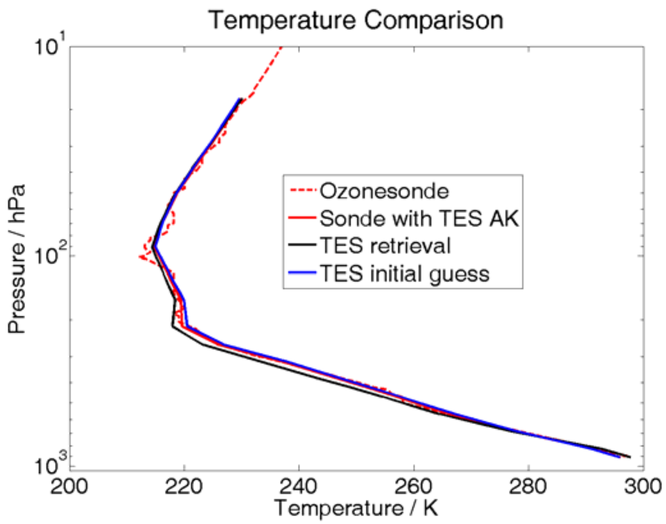
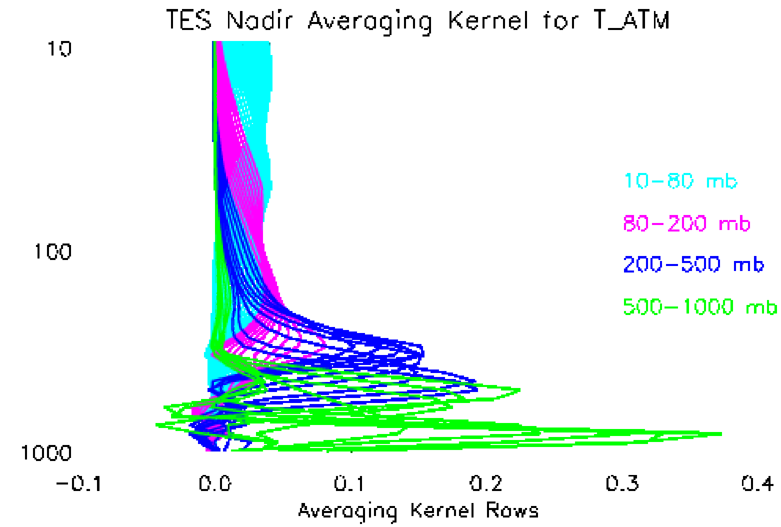
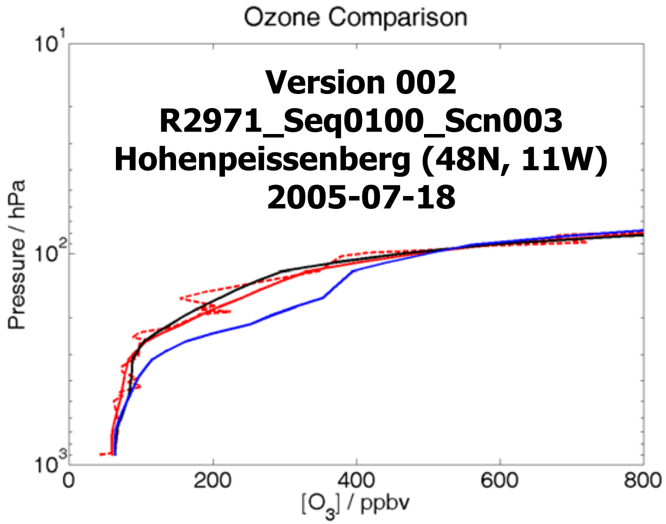
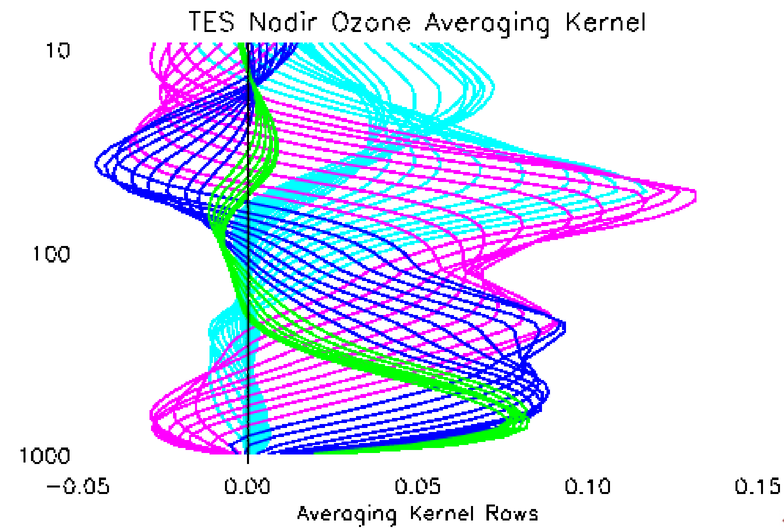
Applying the TES Averaging Kernel and Constraint









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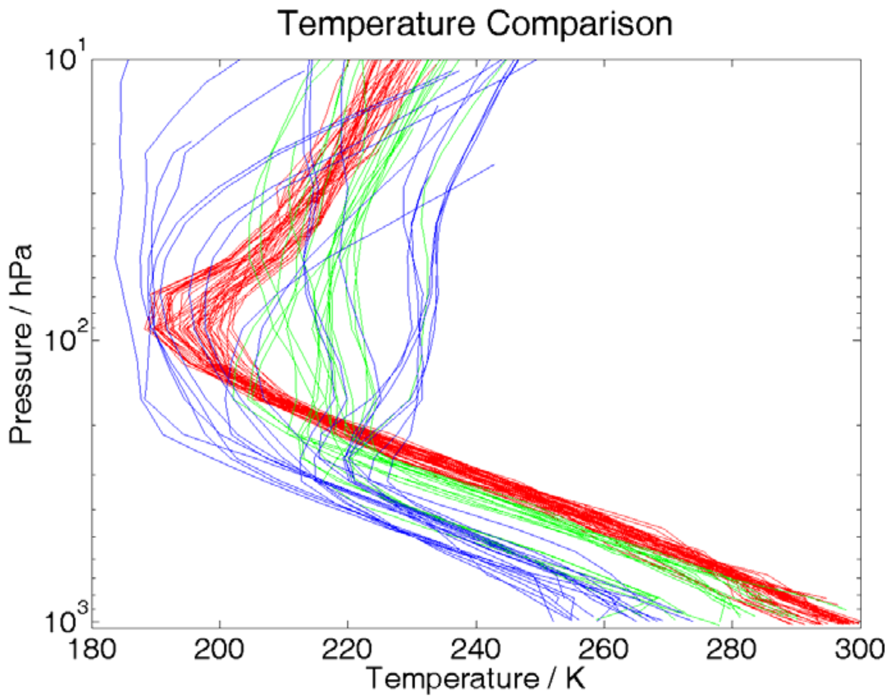
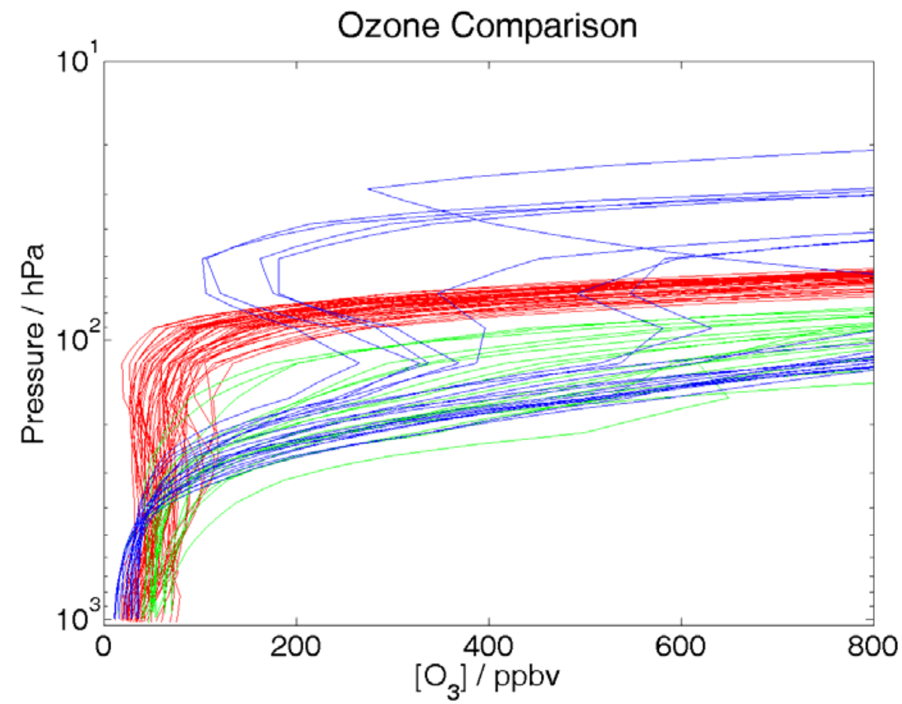
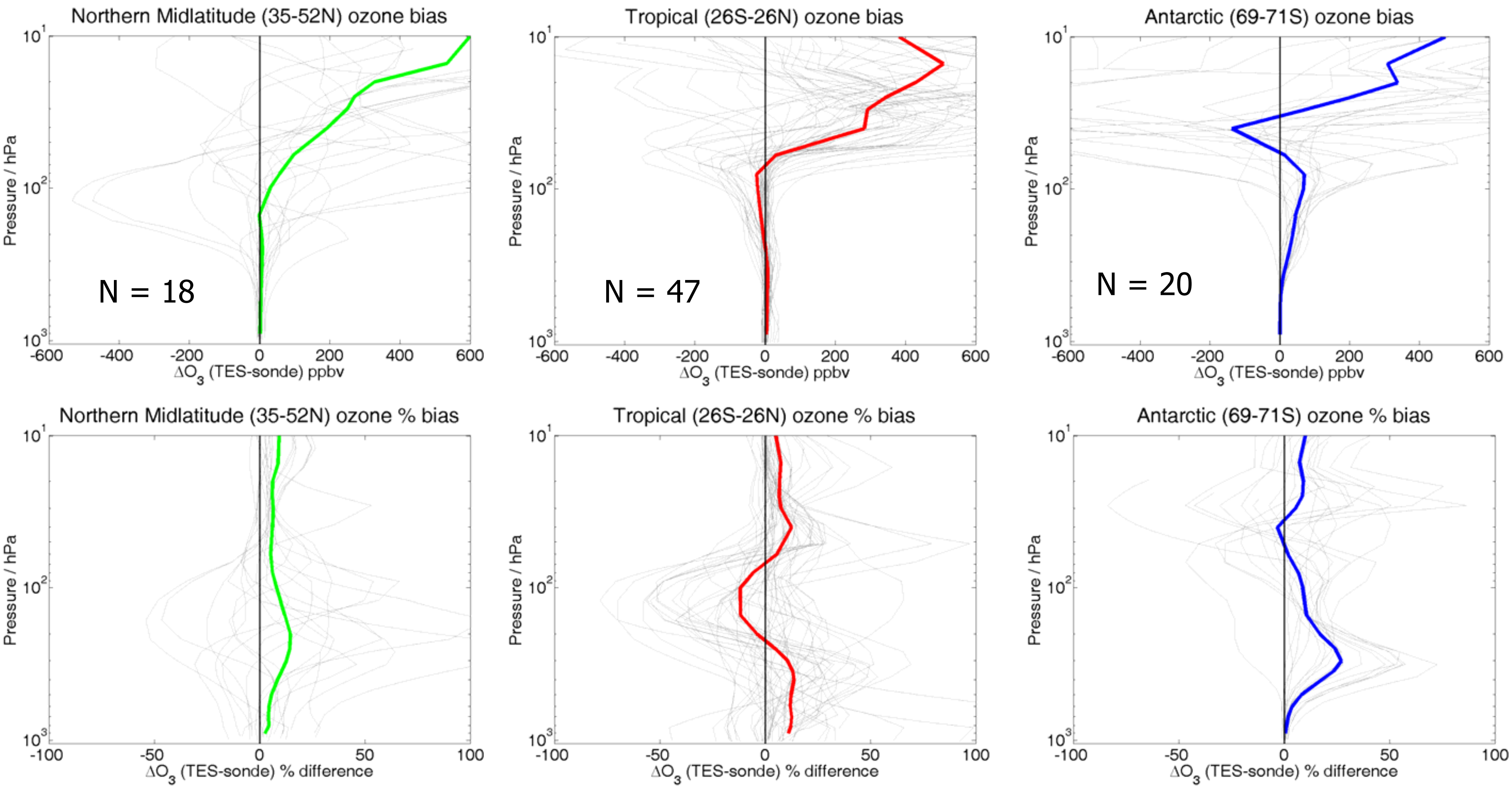
TES Temperature and Ozone: 3 Latitude Zones





Green – Northern midlatitudes (35-52ºN)
Red – Tropics (26ºS-26ºN)
Blue – Antarctic (69-71ºS)

TES-sonde ozone differences in 3 latitudes zones



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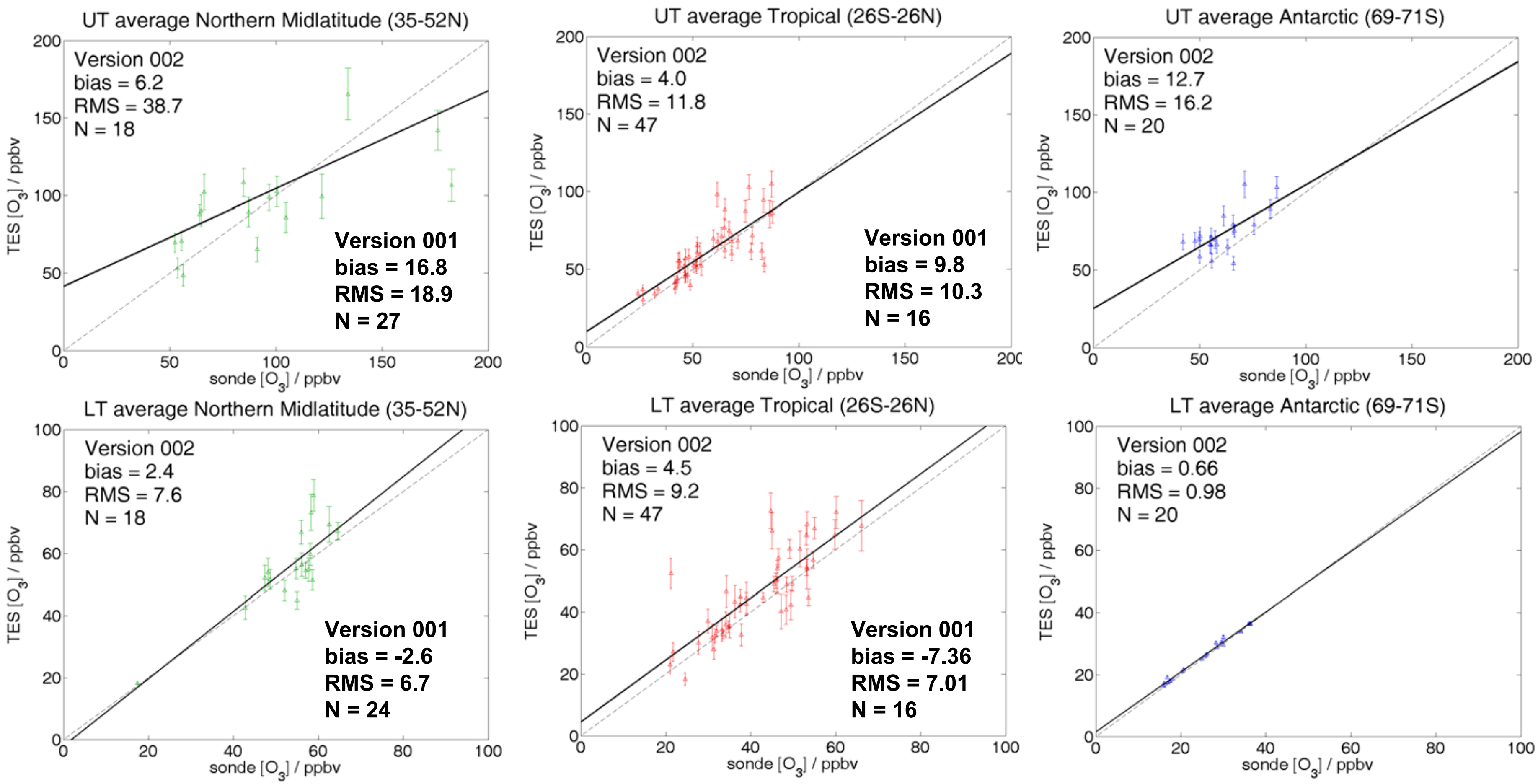
TES vs. sonde ozone upper troposphere (UT) and lower troposphere (LT) average correlations in 3 latitudes zones



LT (surface - 500 hPa) and UT (500 hPa - 200 hPa or tropopause, whichever is larger)

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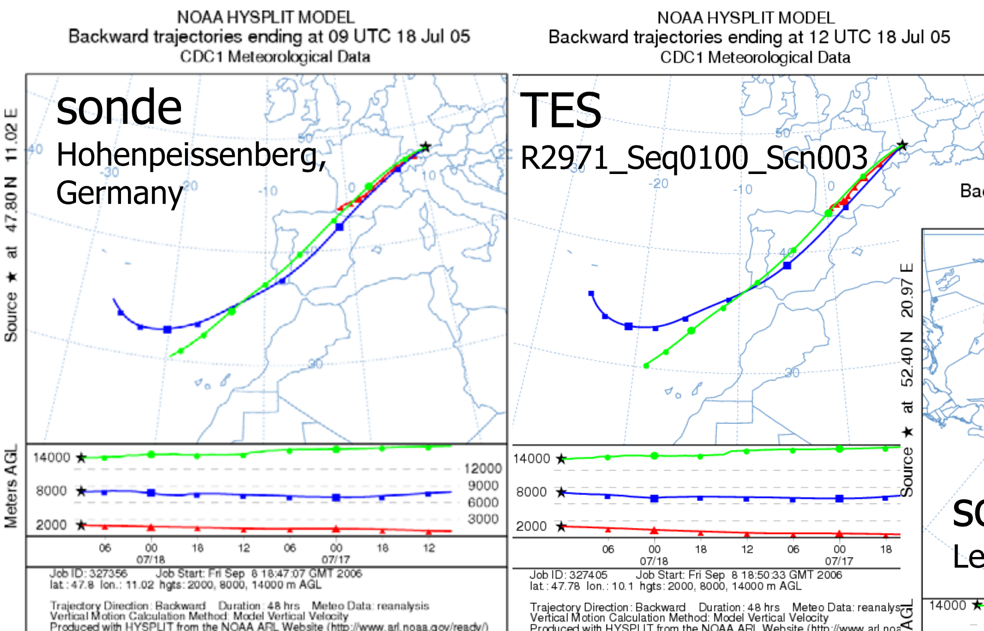
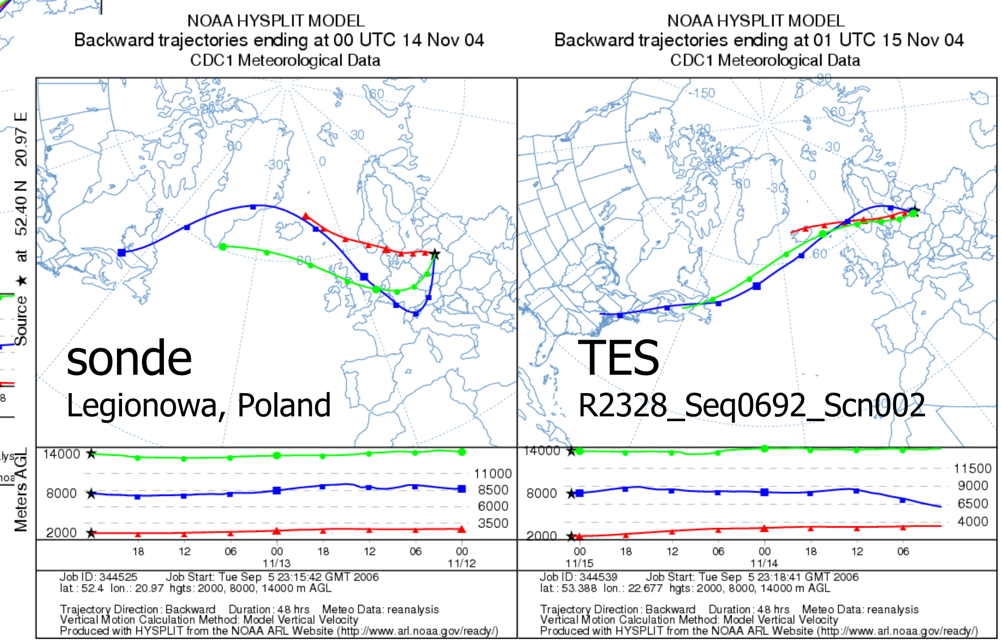
Coincidence Criteria, Outliers, Back Trajectories

Removed TES data based on qflag=0 (41) or emission layer (3)
Removed coincidence pairs based on $|\Delta T| > 5$ K (14) for multiple levels

68 km, 3.4 hrs, $|\Delta T| < 5$ K over all levels



191 km, 24.9 hrs
$|\Delta T| > 5$ K over multiple levels



HYSPLIT
HYbrid Single-Particle Lagrangian Integrated Trajectory
Model access via NOAA ARL READY Website:
http://www.arl.noaa.gov/ready/hysplit4.html

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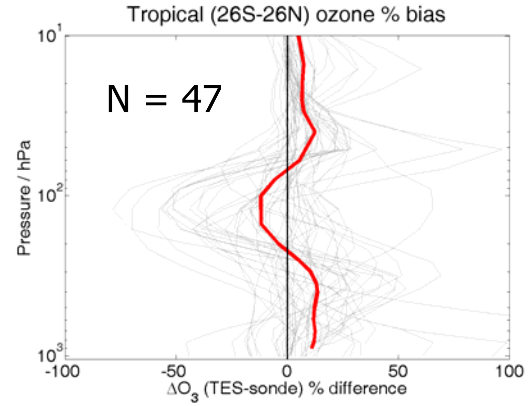
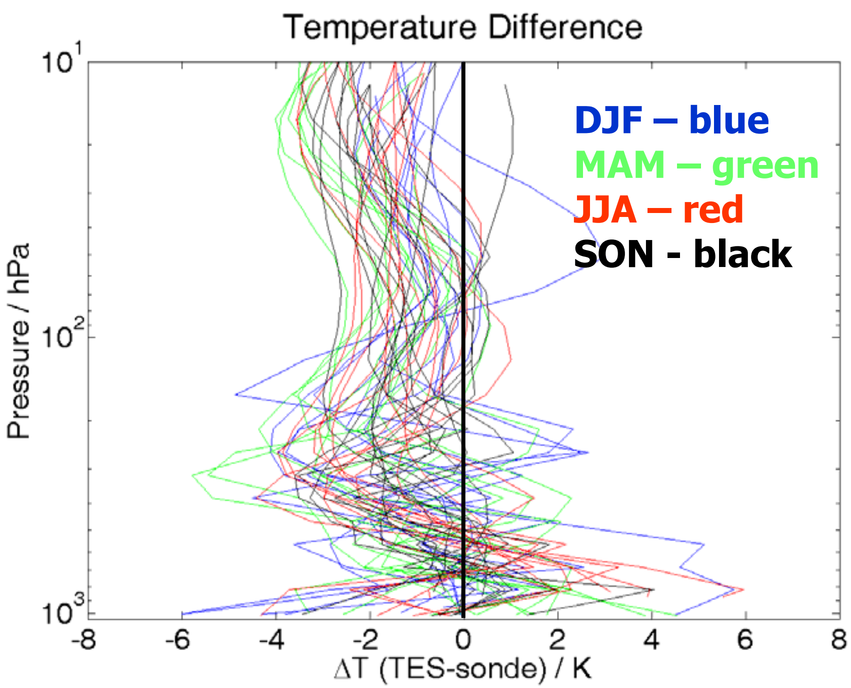
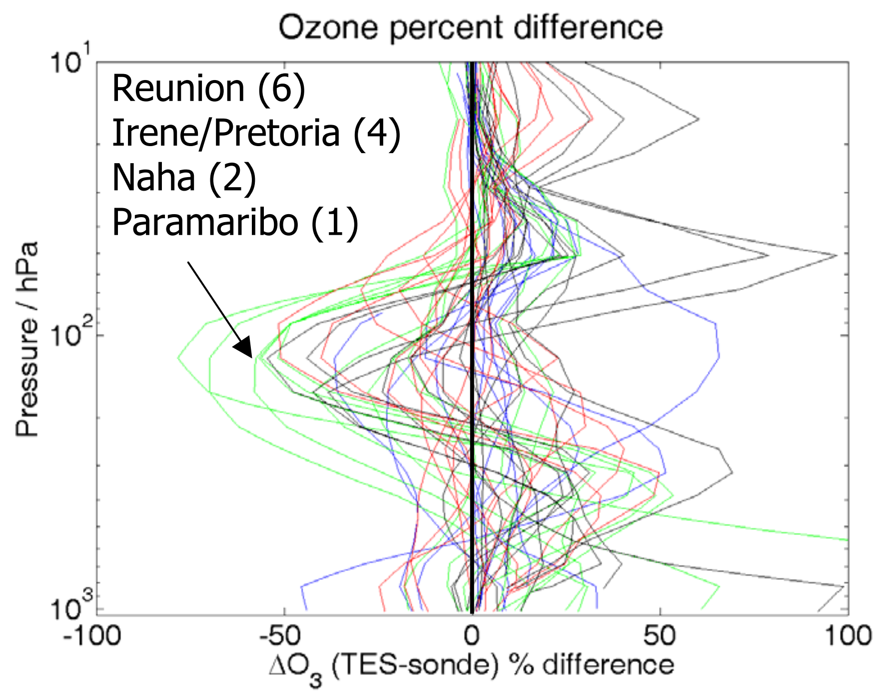
Tropical Variability

Difficult to examine seasonal variability in other latitude zones because of low number of coincidences per season.

Tropics contain the largest source of tropospheric ozone (biomass burning).







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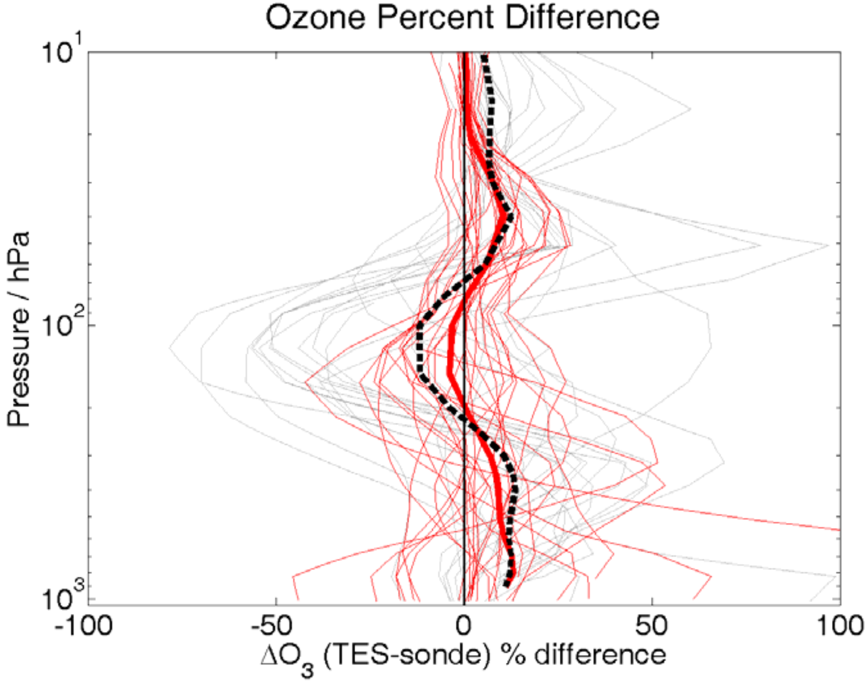
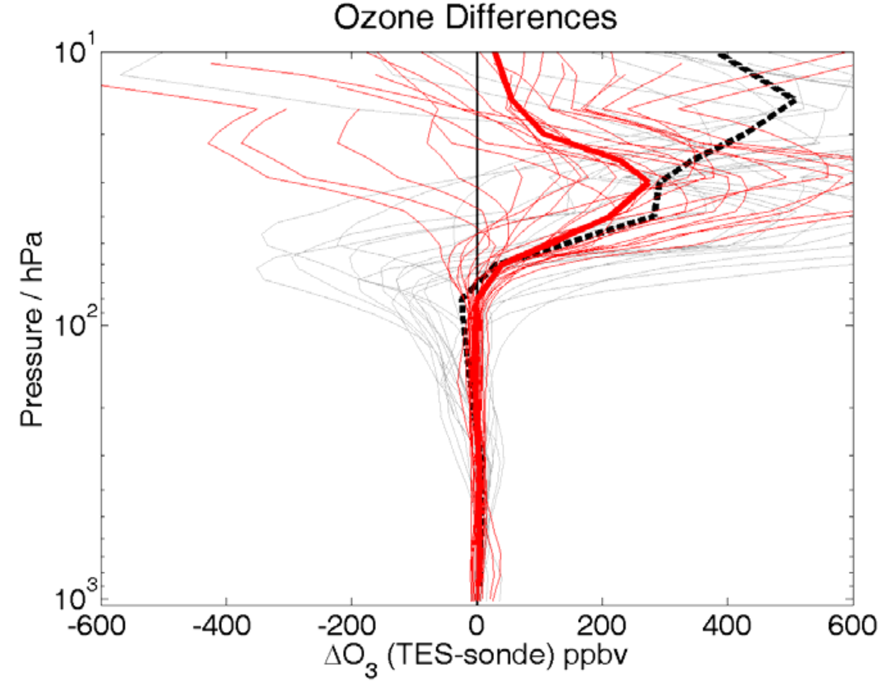
Tropics (10ºS-10ºN) and Subtropics (20-26ºS/N)





Red (10ºS-10ºN)   Gray + black dashed (26ºS-26ºN)

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Conclusions

- TES nadir ozone profiles are typically biased high in all three latitude zones, but this bias has been reduced from that determined in Worden et al. (2006) for V01
- The current absolute bias is higher between 10-100 hPa, but the % bias is higher for lower altitudes
- Mean ΔO_3 (TES-sonde) % from the surface to 200 hPa are:
  Northern midlatitude: 4-17%, Tropical: -5-14%, Antarctic: 0-27%
- The main exception to the high bias in ozone occurs in the subtropics between ~100-300 hPa
- The RMS or variability in the ΔO_3 was highest in the Northern midlatitude UT and lowest in the Antarctic LT
- The biases and variability characterized here should be considered in any scientific studies using TES ozone data
- The availability of more coincidences would be valuable in further characterizing the TES ozone biases and variability